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# *Cypringlea*, a New Genus of Cyperaceae from Mexico

Mark T. Strong

Department of Systematic Biology, MRC/166, Smithsonian Institution, 10th & Constitution Avenue, Washington, D.C. 20560–0166, U.S.A. strong.mark@nmnh.si.edu

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**ABSTRACT.** Studies of the floral morphology of the Mexican endemics *Scirpus analecta* Beetle and *Scirpus coahuilensis* Svenson, including embryo morphology and scanning electron microscopy (SEM) studies of the achenes, achene pericarp, and perianth bristles, indicate that like *Scirpus* L., they are members of the tribe *Scirpeae* Kunth ex Dumortier. However, they were found to possess a *Carex*-type embryo that is characteristic of *Trichophorum* Persoon. Because of differences in habitat, leaf blade development and morphology, inflorescence morphology, and the possession of rudimentary perianth bristles, they are shown to be better circumscribed in a genus of their own, *Cypringlea* M. T. Strong. *Cypringlea* is described, and the combinations *C. analecta* (Beetle) M. T. Strong and *C. coahuilensis* (Svenson) M. T. Strong are validated. Drawings of the embryos, SEM images of the achenes, achene pericarp, and perianth bristles, and photographic images of herbarium type specimens of the plants are provided, and the relationships of *Cypringlea* to *Scirpus* and *Trichophorum* are discussed.

**Key words:** Cyperaceae, Cyperoideae, *Cypringlea*, Mexico, *Scirpeae*, *Scirpus*, *Trichophorum*.

Since the seminal classification of embryos of the Cyperoideae (Cyperaceae) by Van der Veken (1965), from which much of the present-day relationships of species in that subfamily have been based, there still remain species described in the heterogeneous *Scirpus* L. that are discordant with today's circumscription of it, in which *S. sylvaticus* L. has been conserved as the type (Wilson, 1989). Two rare and little-known Mexican endemics, *S. analecta* Beetle and *S. coahuilensis* Svenson, members of the tribe *Scirpeae* Kunth ex Dumortier, are examples of species that are still unclassified.

## METHODS

Achenes were soaked in a mixture of distilled water and antibacterial detergent for 24 hours. The pericarp was then split on the two lateral costula and peeled away. Embryos were teased out of the bottom of the mass of endosperm and placed in a

clearing solution of lactophenol (Parker, 1976) for 24 to 96 hours. They were then mounted in Hoyer's solution and the features drawn using a camera lucida. For the scanning electron microscopy studies, achenes were mounted onto 12 mm SPI aluminum luster mounts using double-sided tape tabs. These were then carbon-coated and observed using a digital Leica Scanning Electron Microscope.

## EMBRYOS

The two species of *Cypringlea* have embryos of the *Carex*-type (Fig. 1) following Van der Veken (1965) and Goetghebeur (1986). The *Carex*-type embryo is circumscribed as top-shaped, has a basal radicle, and the orientation of the germination pore, relative to the first leaf, is perpendicular. The embryo of *C. analecta* measures  $0.34\text{--}0.39 \times 0.24\text{--}0.29$  mm and that of *C. coahuilensis* is  $0.47\text{--}0.52 \times 0.33\text{--}0.39$  mm.

## DESCRIPTION OF THE GENUS

***Cypringlea*** M. T. Strong, gen. nov. TYPE: *Cypringlea analecta* (Beetle) M. T. Strong  $\equiv$  *Scirpus analecta* Beetle.

Inter species tribus *Scirpeae*, *Trichophoro* affine, differt laminis foliis benevolutis, apicibus attenuatis triquetris; inflorescentia anthelata; rostro achenio nullo marginato ab rima humili in apice achenio; setis gerentibus hamis antrorsis rudimentariis distalibus quibus apicibus obtusis vel rotundatis, deminutis ad protuberationibus minutis proximalibus.

Rhizomatous perennial glabrous herbs; roots coarse, to 1 mm thick. Culms 30–70 cm tall, triquetrous or obtusely trigonous in cross section. Leaves basal or several lower cauline; sheaths very short, herbaceous to thickly herbaceous, auriculate at apex in one species, the inner band membranous with a truncate to deeply U- or V-shaped orifice; ligule a narrow band of thickened smooth or lacerate tissue at adaxial junction of sheath and blade; blades herbaceous, linear or linear-filiform, flattened to V-shaped or folded or wiry and triangular-channeled, the margins and abaxial midvein (when present) antrorsely scabrous. Inflores-



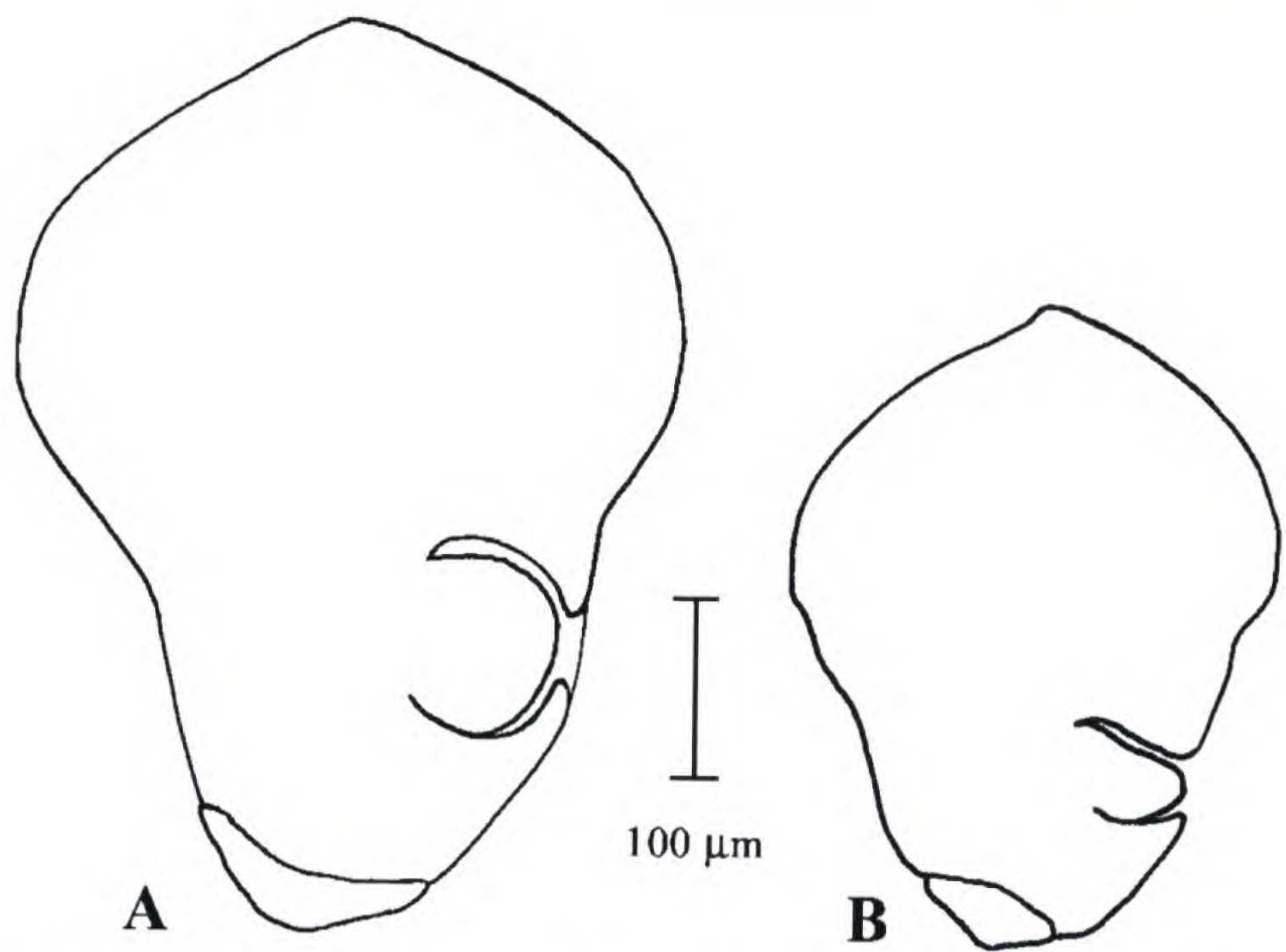


Figure 1. Embryos of *Cypringlea*. —A. *C. coahuilensis* (Svenson) M. T. Strong, from *Johnston 8763* (LL). —B. *C. analecta* (Beetle) M. T. Strong, from *Pringle 3175* (US).

cence a compound umbel-like corymb or a single fascicle or cymose panicle of 2–3 subcontiguous fascicles of spikelets at the summit of the culm; involucre bracts 2–5, leaf-like or linear-setaceous, the lowermost 1–2 elongate and often exceeding the inflorescence; rays ascending or curving with age; spikelets ovoid-ellipsoid to ellipsoid or ellipsoid-obovoid when immature, 5–10 × 2–3 mm, each subtended by a 2-nerved prophyll at base, the scales often spreading with maturing achenes; scales ovate to widely ovate or ovate-elliptic to oblong-ovate, obtuse to rounded or broadly rounded in cross section, thinly herbaceous to submembranous, semi-glossy, midcosta distinct, mucronate at apex, lateral nerves indistinct; fertile scales 10–30 per spikelet; sterile scales 0–4 at base of spikelet. Flowers bisexual, loosely spirally arranged or sometimes irregularly distichous proximally; stamens 3, the anthers basifixed, thecae parallel, longitudinally dehiscent; style 3-branched. Achene obscurely trigonous to plano-convex, obovate to elliptic-obovate or broadly obovate, 1.5–2 × 0.8–1.5 mm, rounded to subrounded or obtuse at apex, cuneate at base, adaxial side often slightly concave, margins indistinctly costate or distinctly so proximally, pale

brown, lighter than the sides, epidermis very finely cellular-reticulate when immature, papillose at maturity, stramineous to light brown when immature, dark brown at maturity; epidermal cells 6-sided, isodiametric, each with an apical nodule that is well-developed and buttressed at maturity, the walls essentially straight when immature, forming a wavy configuration at maturity; style base essentially absent, at most a depressed-pyramidal remnant of tissue or a low, 3-sided rim at achene apex, 0.1 mm long or less, 0.1–0.2 mm wide, brown; bristles 2–4, subulate, reddish, often represented only by short rudiments that rarely reach to middle of achene, the longer often with antrorse to divergent, blunt- or round-tipped barbs distally, these often reduced to small nubs proximally; embryo of the *Carex*-type.

*Distribution.* The genus contains two species endemic to Mexico.

*Etymology.* *Cypringlea* is named in honor of botanical explorer Cyrus Guernsey Pringle (1838–1911), the first collector of *C. analecta*, who collected plants in Mexico between the years ± 1882 and 1907.

KEY TO THE GENERA OF THE TRIBE SCIRPEAE

- 1. Perianth of scale-like tepals, persistent on the rachilla . . . . . *Oreobolopsis* T. Koyama & Guaglianone
- 1'. Perianth of bristles, often persistent at base of achene . . . . . 2
- 2(1). Bristles 10 to many, greatly elongating after anthesis and often forming white cottony masses around spikelets . . . . . *Eriophorum* L.
- 2'. Bristles 3 to 6 or rudimentary, short or reduced, rarely elongating and forming white or brown wooly masses around spikelets . . . . . 3
- 3(2). Bristles with spine-like, retrorsely set barbs . . . . . 4



- 3'. Bristles with antrorsely or divergently set hairs or blunt barbs, rarely smooth, sometimes rudimentary . . . . . 6
- 4(3). Inflorescence compound, anthelate with elongate rays; spikelets numerous . . . . . *Scirpus* L.
- 4'. Inflorescence a simple head of 1 to few spikelets at the summit of the culm . . . . . 5
- 5(4). Inflorescence pseudolateral; style 2-branched . . . . . *Amphiscirpus* Oteng-Yeboah
- 5'. Inflorescence capitate; style 3-branched . . . . . *Phylloscirpus* C. B. Clarke
- 6(3). Leaf blades reduced, often with rounded or thickened tips; inflorescence typically of a single spikelet; achenes beaked or shortly so; bristles well-developed . . . . . *Trichophorum* Persoon
- 6'. Leaf blades well-developed, attenuate to triquetrous apex; inflorescences anthelate or paniculate; achenes unbeaked; bristles rudimentary . . . . . *Cypringlea*

KEY TO THE SPECIES OF *CYPRINGLEA*

1. Leaf blades linear, (2–)3–7.2 mm wide, flattened distally, often V-shaped or folded proximally, essentially straight, slightly curving only toward apex; inflorescence a compound, umbel-like corymb, 3.5–11 × 2–7 cm, the spikelets in small fascicles or sometimes solitary at tips of shorter secondary rays . . . . . 1. *C. analecta*
- 1'. Leaf blades linear-filiform, wiry, 0.3–0.8 mm wide, triangular-channeled, wavy and curling; inflorescence a single dense fascicle or cymose panicle of 2–3 subcontiguous fascicles of spikelets, 1–3 × 1–2 cm . . . . . 2. *C. coahuilensis*

DESCRIPTION OF THE SPECIES

**1. *Cypringlea analecta*** (Beetle) M. T. Strong, comb. nov. Basionym: *Scirpus analecta* Beetle, Brittonia 5(2): 148. 1944 (as “analecti”). TYPE: Mexico. San Luis Potosí: Minas de San Rafael, May 1911 (July 1911, UC #157273), C. A. Purpus 5454 (holotype, NY; isotypes, F, GH, MO, UC, US). Figures 2, 4.

*Scirpus analecta* var. *evadens* C. D. Adams, Ann. Missouri Bot. Gard. 78: 254. 1991. Syn. nov. TYPE: Mexico. Chiapas: steep slope with *Quercus* and *Pinus*, 3 mi. S of Aguacatenango along road to Pinola Las Rosas, Municipio of Venustiano Carranza, 5600 ft., 25 June 1965, D. E. Breedlove 10570 (holotype, F #1679132).

Culms solitary, often forming basal offshoots, 30–70 cm tall, 1–2.3 mm wide, erect to ascending, slender, triquetrous, firm but flexuous, coarsely ribbed, green to pale green, the angles finely and closely antrorsely scabrous, often smooth proximally, the sheath-clad bases (4–)7–12 mm wide. Leaves 5–14, 16–80 cm long, ascending, approximate at or just above the base, often appearing subverticillate, ecauline; sheaths short, herbaceous, finely and distinctly veined, light green or often stramineous, old sheath bases brown, often persistent and becoming fibrillose, the inner band with a truncate to deeply U-shaped orifice; ligule a narrow, thickened band of tissue; blades linear, (2–)3–7.2 mm wide, flattened distally, often V-shaped or folded proximally, finely veined and green both adaxially and abaxially, margins and abaxial midvein

finely and closely antrorsely scabrous, long-attenuate to triquetrous apex. Inflorescence a compound, umbel-like corymb, terminal, 3.5–11 × 2–7 cm; involucral bracts several, the lowermost 1–2 leaf-like, elongated and often exceeding the inflorescence, the uppermost linear-setaceous; rays ascending to curving with age, flexuous, flattened or compressed-trigonous, antrorsely scabrous on margins distally, smooth proximally, the spikelets often fascicled or sometimes solitary at tips of shorter secondary rays; spikelets 13–90 per inflorescence, ovoid-ellipsoid or sometimes ellipsoid-obovoid when immature, 5–7(–8) × 2–3 mm, with spreading scales, cuneate at base, acuminate at apex; scales broadly rounded in cross section, dorsally truncate or slightly furrowed longitudinally along midcosta, thinly herbaceous, light yellow-brown to yellow-brown, sometimes with brown sides, margins narrowly scarious proximally, midcosta 3-nerved, light green, thickening distally, prolonged beyond the obtuse apex as a short mucro, lateral nerves indistinct; fertile scales 10–20, ovate-elliptic to oblong-ovate, 1.8–3 × 1–1.3 mm; sterile scales 2–4 at base (excluding 2-nerved prophyll), ovate, shorter than the fertile. Flowers loosely spirally arranged or appearing 4-ranked, the rachilla slightly elongated between the flowers; anthers 1.5–2 mm long, apiculate at apex, rounded with minute papillae at base; style branches reddish, scaly-fimbriate, equaling to 1/3 longer than unbranched portion. Achene obovate to elliptic-obovate, 1.5–1.8 × 0.8–1.1 mm, rounded at apex, margins sometimes distinctly costate proximally, indistinctly so distally.

*Distribution.* Endemic to Mexico. Occurs on the western side of the Sierra Madre Oriental in the states of San Luis Potosí and Hidalgo, south to Puebla state in the Cerro de Paxtle, and southeast to a disjunct population in the Sierra Madre de Chiapas in Chiapas state.

*Etymology.* “Analecta” or “analects” is a plural noun sometimes used in titles meaning extracts or collections, typically from a particular classical author. It also has a slightly pejorative sense of



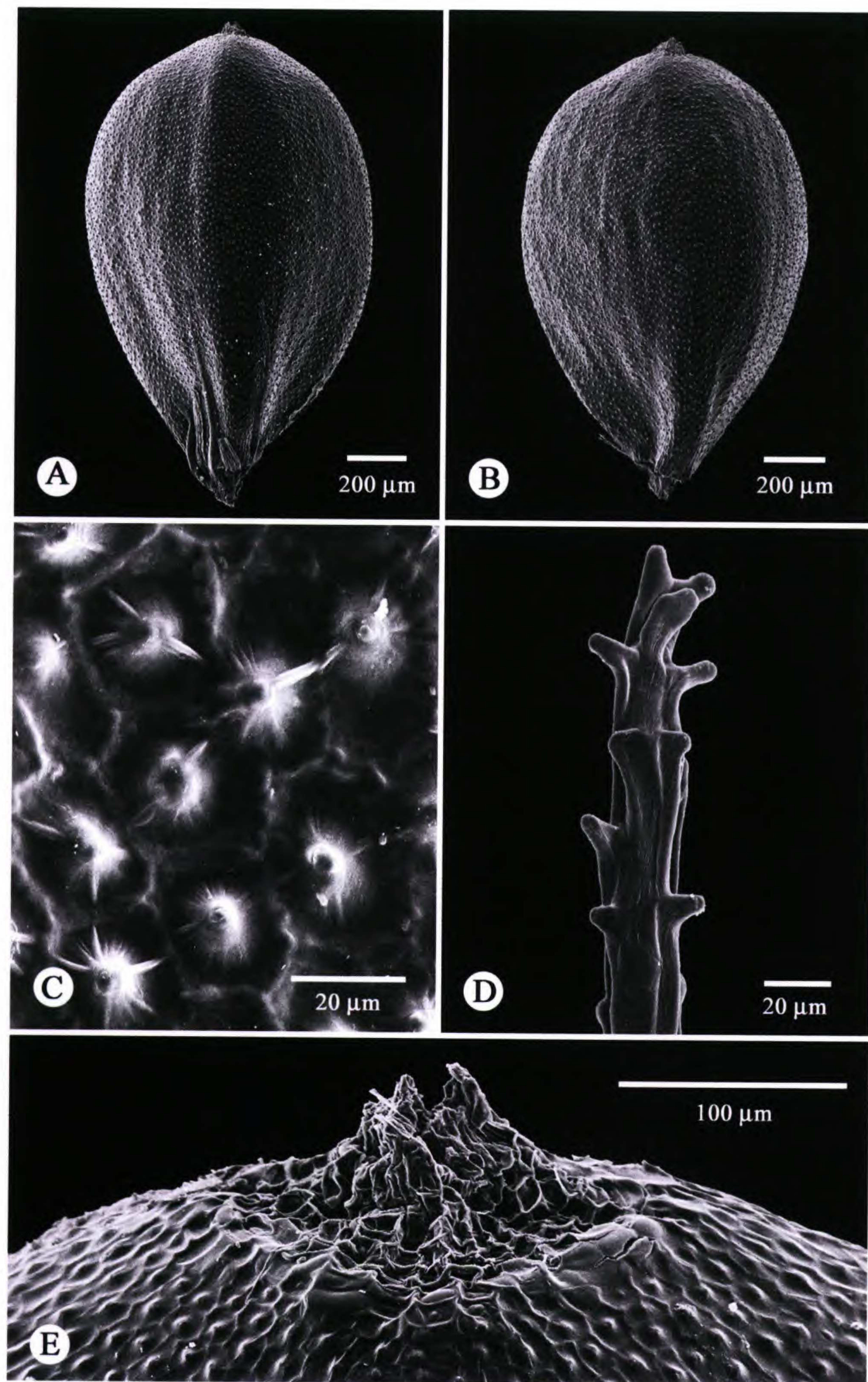


Figure 2. Achenes of *Cypringlea analecta* (Beetle) M. T. Strong. —A, B. Achenes. —C. Detail of epidermal cells. —D. Detail of distal end of bristle. —E. Apex showing detail of style base. From *Pringle 3175* (US).



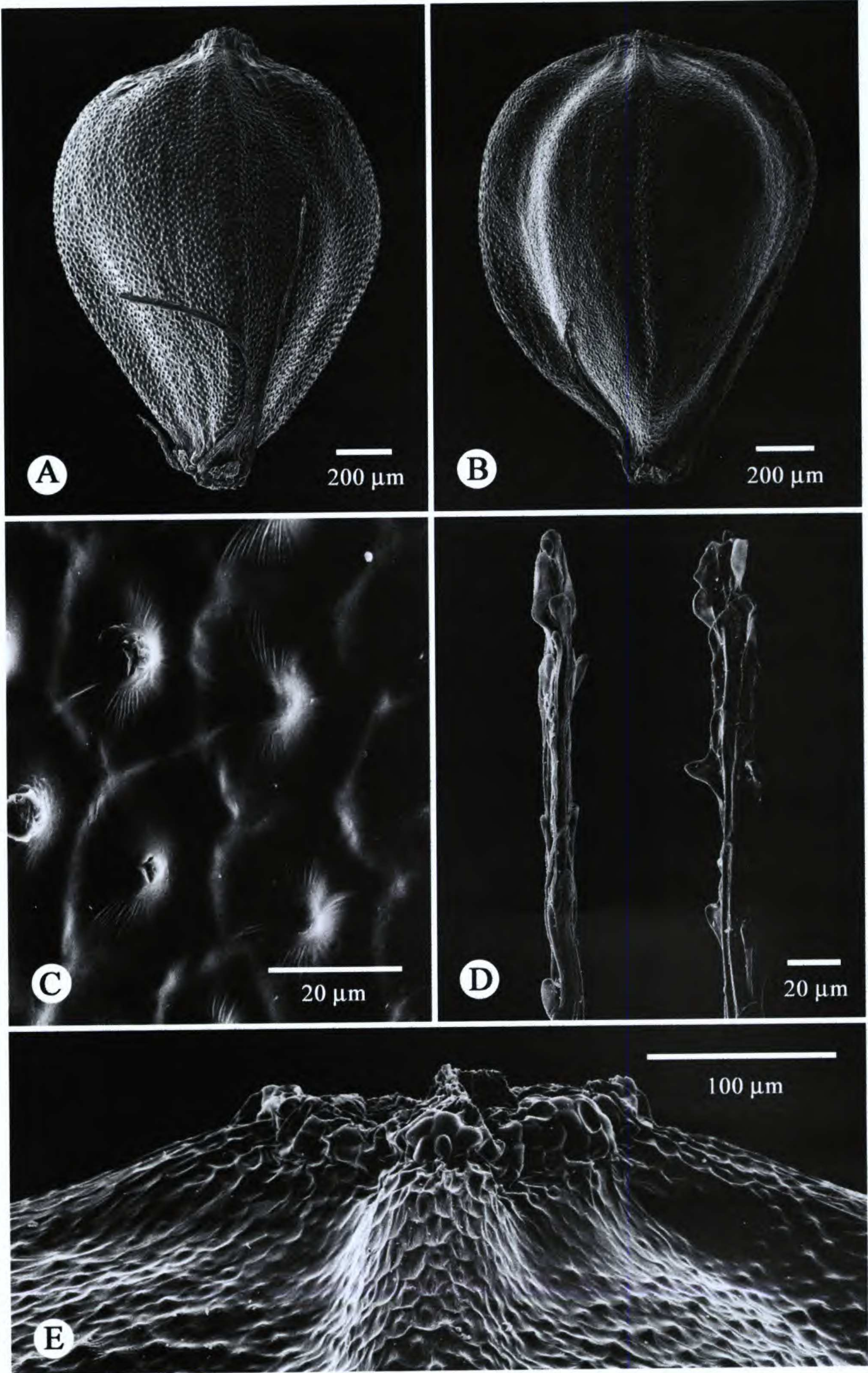


Figure 3. Achenes of *Cypringlea coahuilensis* (Svenson) M. T. Strong. —A, B. Achenes. —C. Detail of epidermal cells. —D. Detail of distal ends of bristles. —E. Apex showing detail of style base. From *Johnston 8763* (LL).





Figure 4. Herbarium type specimen, *Purpus* 5454 (UC), isotype of *Cypringlea analecta* (Beetle) M. T. Strong.



“crumbs” or “leftovers.” There seems to be no justification for retaining “analecti” (as originally published by Beetle), and the usual form *analecta* (noun in nominative plural) is here restored.

*Cypringlea analecta* was first named *Scirpus potosinus* by Britton (1892: 77) in a checklist of North American Cyperaceae. It was based on a Pringle collection (3175) from San Luis Potosí, Mexico. Britton gave the author as C. B. Clarke and cited it as *ined.* It was later listed by Clarke (1908: 89) in a manuscript published after his death, as *Scirpus potosiensis* C. B. Clarke, citing the earlier reference of Britton. Beetle (1944), noting that both these proposed names were *nomina nuda*, proposed the name *Scirpus analecti* and designated *Purpus* 5454 as the holotype. Beetle also indicated that two other specimens he did not see belonged to this species, *Parry & Palmer* 905 and *Arsène* 2636, brought to his attention by Hugh O'Neill, curator of the Langlois Herbarium, Catholic University (CU). However, these two specimens (both at US) belong to another species, *Karinia mexicana* (Britton) Reznicek & McVaugh. *Cypringlea analecta* has continued to be treated as a species of *Scirpus*, most recently by Adams (1994) in *Flora Mesoamericana* and Espejo Serna and López Ferrari (1997).

I have found no taxonomic significance to the inflorescence of *Scirpus analecta* var. *evadens* C. D. Adams in which the spikelets are solitary at ray tips. The specimen *Purpus* 2889 (GH, US), from Puebla, is intermediate between the fascicled spikelets of the type material and that of *S. var. evadens* in having both solitary and fascicled spikelets at ray tips.

*Representative specimens.* MEXICO. **Hidalgo:** Jacala, July 1936, *E. Lyonnet* 1318 (US). **Puebla:** vicinity of San Luis Tultitlanapa near Oaxaca, Cerro de Paxtle, rocky slopes, July 1907, *C. A. Purpus* 2889 (GH, US). **San Luis Potosí:** moist banks of ravines, 15 Aug. 1890, *C. G. Pringle* 3175 (F, ISC, MU, NY, US).

**2. *Cypringlea coahuilensis*** (Svenson) M. T. Strong, comb. nov. Basionym: *Scirpus coahuilensis* Svenson, *J. Arnold Arbor.* 25: 46. 1944. TYPE: Mexico. Western Coahuila: high limestone ridge with a forest of *Pinus pinceana*, abundant on rocky pine-clad slopes, SW end of the Sierra de la Fragua, 1–2 km N of Puerto Colorado, 2 Sep. 1941, *I. M. Johnston* 8763 (holotype, GH not seen; isotype, TEX—2). Figures 3, 5.

Culms caespitose, 30–50 cm tall, 0.6–1 mm wide, ascending, obtusely trigonous, wiry, stiff, coarsely ribbed, smooth, pale green, the sheath-clad bases 5–10 mm wide. Leaves 3 to 5, basal and

lower cauline, 10–35 cm long, ascending; sheaths herbaceous to thickly herbaceous proximally, membranous distally, coarsely veined, brown proximally, pale distally, the inner band with a deeply V-shaped orifice, auriculate at junction with blade; ligule a narrow band of lacerate tissue formed near base of the auricles; blades linear-filiform, wiry, 0.3–0.8 mm wide, triangular-channeled, wavy and curling, coarsely veined abaxially, smooth and V-channeled adaxially, pale green both adaxially and abaxially, margins closely antrorsely scabrous, triquetrous at apex. Inflorescence a single fascicle or a cymose panicle of 2–3 subcontiguous fascicles of spikelets at the summit of the culm, 1–3 × 1–2 cm; involucre bracts 2–3, linear-setaceous, 0.3–0.5 mm wide, the lowermost 1–2 greatly exceeding the inflorescence, 2–16 cm long; rays 1–2, short, ascending, flexuous, obtusely trigonous, crescentiform or subterete in cross section, smooth on margins; spikelets 3–9 per inflorescence, sublaterally compressed, ovate-elliptic to elliptic, 7–10 × 2–3 mm, acute to acuminate on both ends, the scales spreading with developing achenes; scales obtuse to rounded or broadly rounded in cross section, thinly herbaceous to submembranous, finely longitudinally cellular-striate, whitish- or stramineous-translucent, glabrous, margins broadly scarious, midcosta 3-nerved, pale green, prolonged beyond the obtuse to subrounded apex as a short mucro, lateral nerves indistinct; fertile scales 20–30, ovate to widely ovate or ovate-elliptic, 2.8–4 × 1.6–2.6 mm, the prophyll at base of spikelet well-developed, 2-nerved, about same size as fertile scales; sterile scales 0–1 at base (excluding 2-nerved prophyll), ovate, slightly shorter than the fertile. Flowers spirally arranged or sometimes subdistichous proximally on rachilla; anthers 1.7–2.2 mm long, rounded-apiculate with minute papillae at apex, short-sagittate with minute papillae at tips of lobes; style branches scaly-fimbriate, equaling to slightly shorter than unbranched portion of style. Achene obovate to broadly obovate, 1.6–2 × 1.1–1.5 mm, obtuse to subrounded at apex, margins indistinctly costate.

*Distribution.* Endemic to Mexico and known only from the type collection from a high limestone ridge in the southwestern end of the Sierra de la Fragua, western Coahuila.

#### DISCUSSION

These two plants representing the new genus, first described as *Scirpus* L., and like *Scirpus* (today treated by many in a strict sense with the conserved



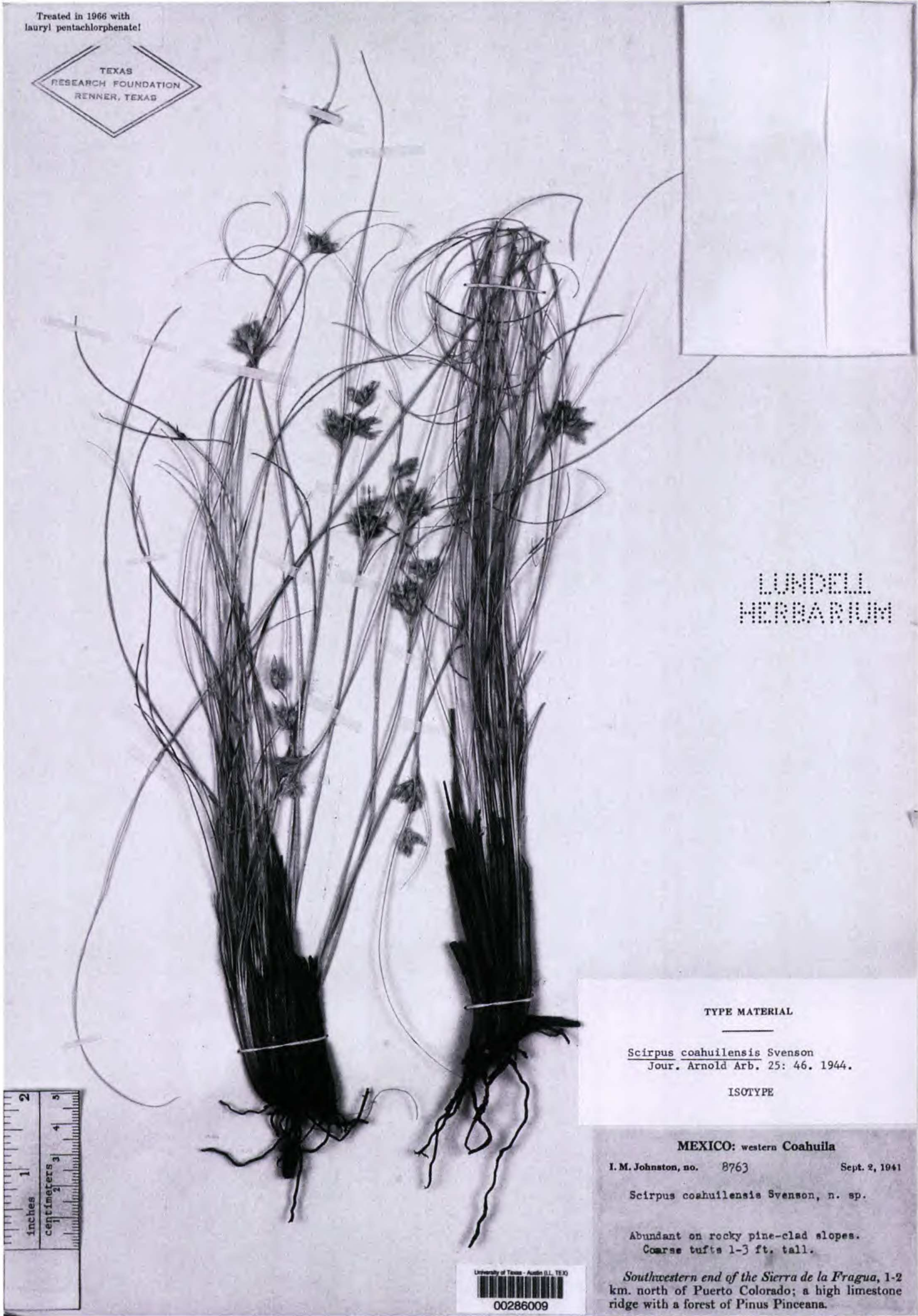


Figure 5. Herbarium type specimen, Johnston 8763 (LL), isotype of *Cypringlea coahuilensis* (Svenson) M. T. Strong.



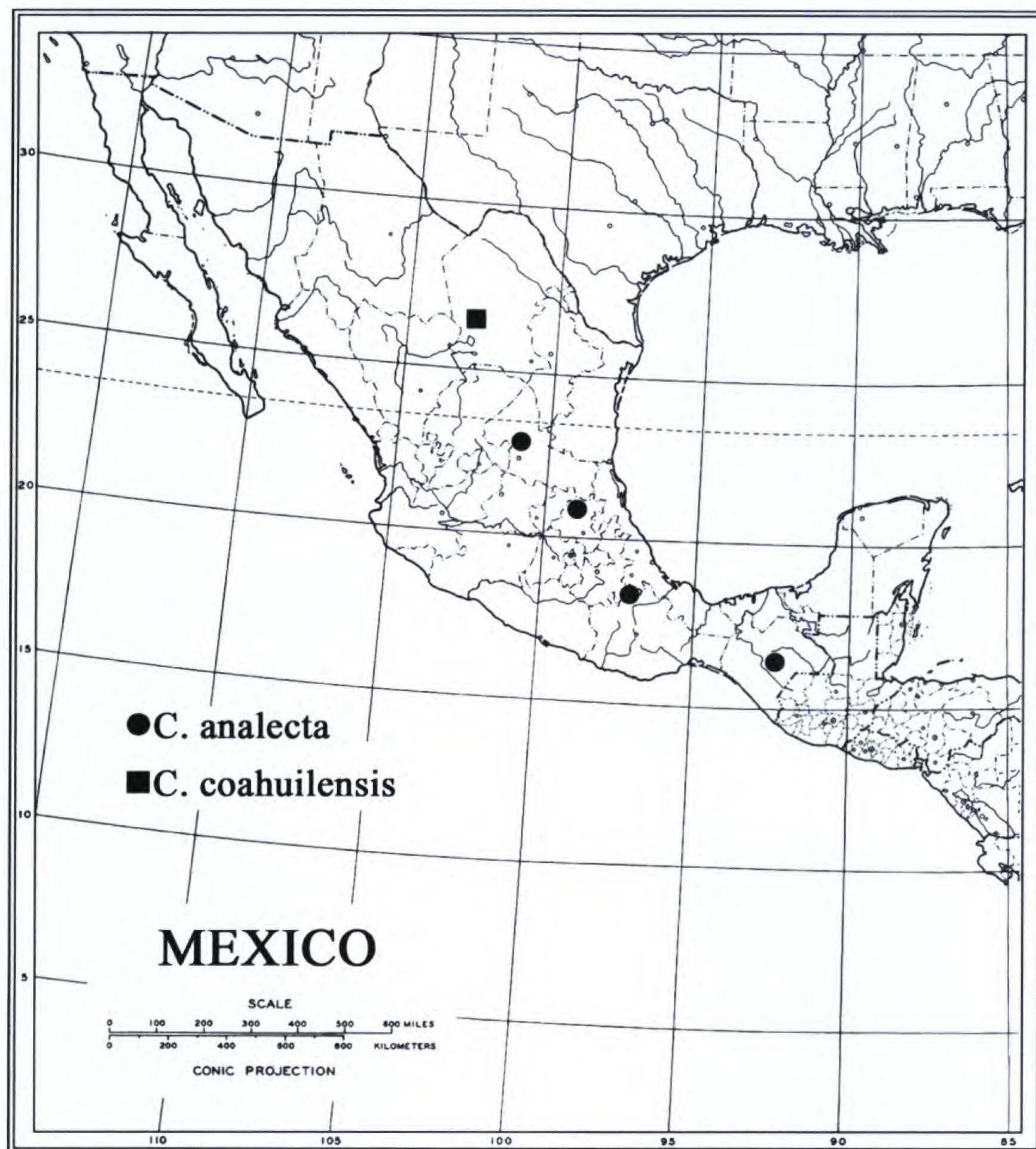


Figure 6. Distribution of *Cypringlea* in Mexico.

type, *Scirpus sylvaticus* L.), are members of the subfamily Cyperoideae Sussenguth following the most recent Cyperaceae classification of Goetghebeur (1998). The spirally arranged scales, embryo type, morphological and epidermal structure of the achene, and presence of persistent perianth bristles places them in the tribe Scirpeae Kunth ex Dumortier. *Scirpus* sensu stricto is characterized by having anthelate inflorescences, a *Fimbristylis*-type embryo, spikelets with all scales fertile, beaked achenes, and generally well-developed bristles with sharply tipped retrorse barbs. *Cypringlea* differs from it in having a *Carex*-type embryo (Fig. 1), 1 to 3 of the basal scales of the spikelet sterile (empty), unbeaked achenes, and rudimentary bristles that bear what appear to be blunt, rudimentary antrorsely or divergently set hairs or barbs at their tips (Figs. 2D, 3D).

The embryos of *Cypringlea* (Fig. 1) are of the *Carex*-type (Van der Veken, 1965; Goetghebeur, 1986) and are closest to its nearest relative, *Tri-*

*chophorum* Persoon. *Cypringlea* differs from *Trichophorum* in having well-developed leaf blades and inflorescence bracts that are attenuate to a triquetrous apex; anthelate or paniculate inflorescences with capitate or fascicled spikelets; achenes (Figs. 2A, 2B, 2E; 3A, 3B, 3E) that are unbeaked, the disarticulation of the style occurring at the apex of the achene, bordered at most by a low, marginal rim (Figs. 2E, 3E); and poorly developed bristles (Figs. 2D, 3D) that bear rudimentary antrorse or divergent hairs or barbs distally that are blunt or rounded at their tips, or reduced to tiny nubs proximally. On the other hand, *Trichophorum* has reduced leaf blades and inflorescence bracts that are generally blunt and obtuse or rounded and often thickened at their apices; inflorescences of a single spikelet, rarely anthelate and never with spikelets fascicled or capitate; beaked or shortly beaked achenes, the style disarticulating at the apex of the beak; and well-developed perianth bristles that are



densely beset with antrorse or divergent fine hairs or barbs.

The achene pericarp cells of *Cypringlea* are isodiametric and 6-sided (Figs. 2C, 3C). When immature, they have a low central nodule and the walls are essentially non-wavy and markedly raised above the surface, forming a reticulation. At maturity, the walls are of a wavy configuration and each has one central conical body with well-developed buttresses between the walls and the body. In species of *Trichophorum*, the cell walls of the pericarp are generally non-wavy and lack buttresses between the walls and apical nodules (Schuyler, 1971).

Species of *Trichophorum* are holarctic and generally occur in wet or inundated alpine, tundra, or acidic bog habitats, rarely in damp or somewhat dry, mesic habitats in woodlands where, for example, the North American species *T. planifolium* (Sprengel) Palla occurs. *Cypringlea* species occur on dry, steep, rocky slopes and ravines, often on limestone substrate with pine and oak. The combination of a strikingly different habitat, well-developed leaf blades that are attenuate at their apices, anthelate or paniculate inflorescences, spikelets often fascicled or in capitate clusters, and rudimentary bristles, separates *Cypringlea* from *Trichophorum*.

*Cypringlea* is endemic to Mexico. It occurs from the Sierra de la Fragua (western side of the Sierra Madre Oriental mountain range) in western Coahuila state (type locality of *C. coahuilensis*) in the north, south to the western side of the Sierra Madre Oriental in the states of San Luis Potosí, Hidalgo, and Puebla (Cerro de Paxtle), and southeast to Chiapas state in the easternmost extent of the Sierra Madre de Chiapas (Fig. 6). Both species occur on steep, rocky slopes and ravines, often on limestone substrate with pine and oak.

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